

NOTES ON THE EGGS AND YOUNG OF  
*GOPHERUS POLYPHEMUS* (DAUDIN)

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Reports on clutch and egg size of *Gopherus polyphemus* (Daudin) (Pope, 1949; Carr, 1952) and a description of a six-month-old individual (Allen and Neill, 1953) constitutes what is known of the young of the southeastern gopher turtle. Observations on two clutches of eggs and young from Alachua County, Florida, have provided additional data on these aspects of the biology of the gopher turtle.

The conspicuous mound of sand at the entrance of the burrow of the gopher turtle has been reported as a possible site for the deposition of eggs (Carr, 1952). Fifteen such mounds were excavated and resulted in the discovery of two clutches of eggs on August 20 and 21, 1958. Although the burrows examined were distributed over approximately 20 acres, the two mounds containing eggs were but 50 feet apart. The eggs in each nest had been laid in one plane, about six inches beneath the surface. The sand above the eggs was exposed to the full rays of the sun.

The clutches were composed of six and seven eggs, respectively. The eggs of the smaller clutch were considerably smaller than those of the larger, and all were somewhat more elliptical than reported by Pope (1949) and Carr (1952), but fell within the general size range recorded for the species. The eggs of each clutch were closely uniform in size and weight, but differences between the two clutches were marked (Fig. 1).

The eggs were brought into the laboratory and incubated in gallon jars lined with moistened paper towels. Hatching began fifteen days later, and the process was observed in some detail for seven young. The sequence of events in each instance was closely similar. The initial cracks in the shell appeared to be made by butting or forcing the snout against the inner surface of the egg. The opening thus made was further enlarged by biting the edge of the opening and withdrawing the head, thereby breaking additional portions of the shell. As the opening became larger, the forelimbs were brought increasingly into play, until eventually

the right forelimb could be extended out of the shell (Fig. 2). In all cases, the right forelimb was protruded first. Eventually the left forelimb was exposed in the same manner. By this time the shell had been broken virtually in two, so that further struggling and movement resulted in the hatchling tumbling out of the shell.

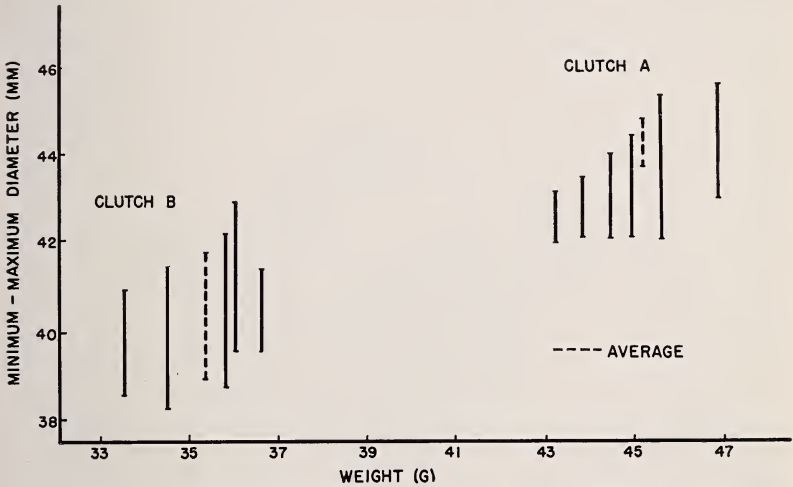


Figure 1. Variation in the size and weight of the eggs of two clutches of *Gopherus polyphemus*.

Hatching required an average of 24 hours, at the end of which time the yolk sac was still large, averaging 10 x 10 x 5 mm. A deep transverse flexure, running across the plastron, between the hyoplastal and hypoplastal elements, allowed the embryonic turtle to fit within the shell. Upon hatching this flexure began to straighten, allowing the remaining yolk to be withdrawn into the enlarging body cavity. Considering the size of the yolk sac at hatching, this withdrawal was rapid, being completed within an additional 18 to 24 hours. This large amount of yolk thus taken into the body cavity would probably explain the seeming indifference of the hatchling to food. Within a day or two they would nibble on green grasses and cantalope, but ate very little. Within 24 hours the yolk sac had disappeared, and the anterior and posterior lobes of the plastron had straightened sufficiently to allow the young to walk. Considering the condition of the young at hatching and the changes which must take place before locomotion



Figure 2. Young of *Gopherus polyphemus* emerging from the egg: about 12 hours after pipping.

is possible, it seems reasonable to assume that under natural conditions they must spend at least a day in the nest before emerging.

The hatchlings from the larger clutch all emerged from the eggs within two days (September 4 to 5), those from the smaller clutch within four (September 22 to 25). One egg failed to hatch within a week following the emergence of the last previous hatchling of the same clutch. This egg was opened, and the embryo was found dead. It was deformed, with the neck and head extended and rigid, lying along, but not fused to, the right brachium. The gulars were massive, and the hindlimbs small and projecting posteriorly. The plastron had not developed the flexure, and the embryo had folded dorsally, presumably causing the death of the individual.

Immediately upon hatching the young averaged 42.9 mm. in length and 43.4 mm. in width. Within six hours these proportions had changed (43.4 mm. in length x 42.1 mm. in width) as a result of the straightening of the body axis. Because of this early "unrolling", comparative measurements were not made until the individuals were at least three days old. A similar post-hatching developmental pattern has been described for *Gopherus agassizii* by Grant (1936). At the end of three days the flexure had almost disappeared and a more constant width/length ratio had been established (Table 1). This is about the same as the ratio (0.86) reported for a 56 mm. individual by Goin and Goff (1941). Intra and inter clutch size and weight relationships of the young paralleled those of the eggs. However, there was no overlap in the size and weight of the hatchlings of the different clutches (Table 1). In general, the larger eggs produced the larger hatchlings.

The coloration of the seven hatchlings examined varied considerably. Not only was there variation between the hatchlings at a given age, but ontogenetic trends were also evident. In general, the hatchlings displayed light to dark yellow centers on the dorsal laminae, as well as on the head and forelimbs; a darker, grayish-yellow on the hindlimbs; a lighter, pinkish-yellow on the plastron; and the margins of the dorsal laminae and marginal series ranged from a deep grayish-brown to brownish-gray. The colors are given more precisely in Table 2. Additional variation existed in the amount of yellow present in the centers of the dorsal laminae (Fig. 3). The texture of the shell of the hatchlings was very granular. The hatchlings agreed generally in coloration with the description



TABLE 1.—LENGTH OF FOUR YOUNG *GOPHERUS POLYPHEMUS* DURING FIRST MONTH, AND COMPARISON WITH THREE SIBLINGS OF A DIFFERENT CLUTCH AT ONE WEEK OF AGE. WIDTH/LENGTH RATIOS ARE GIVEN IN PARENTHESES. (LENGTH IN MM.)

Age	Clutch A					Clutch B			
	1	2	3	4	Avr. (l/w)	1	2	3	Avr. (l/w)
3 days	49.0	47.7	47.4	48.4	48.1 (.885)				
1 week	49.7	49.8	48.4	48.1	49.0 (.867)	45.0	46.2	45.9	45.7 (.864)
2 weeks	50.3	50.4	48.9	48.1	49.4 (.850)				
1 month	50.6	51.2	49.0	48.5	49.7 (.855)				

TABLE 2. COLOR VARIATION IN SEVEN HATCHLING *GOPHERUS POLYPHEMUS* FROM ALACHUA COUNTY, FLORIDA. (COLOR DESIGNATIONS FROM MAERZ AND PAUL, 1930).

Structure	Clutch A				Clutch B		
	1	2	2	4	1	2	3
Head	10J4	12E4	12J4	11H5	10I4	11L5	11L3
Forelimb	10K7	12L7	11L6	11L7	11K4	10L8	11H5
Hindlimb	11J8	13K7	11J6	11F7	10I6	10L6	9K4
Marginals*	10J5	10I5	9I3	9L6	10J8	9K4	9K3
Vertebrales* and Costals	9L6	10K4	9J2	9J7	9K4	9H5	9J3
Plastron	9K5 9J4	9J4 9J6	9J3 9K5	9J2 9I7	9J3 9J5	9I3 10J6	9J5 10H2

\* The gray-brown color of the margin of the dorsal laminae is not listed.

of a six-month-old individual by Allen and Neill (1953), but were lighter and brighter.

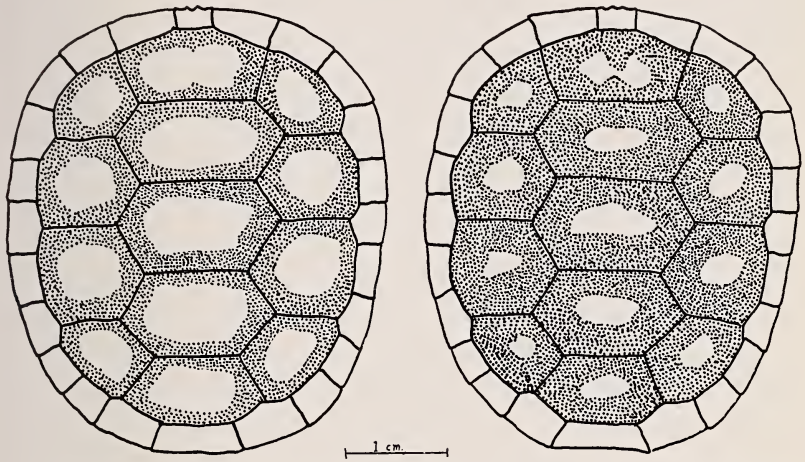


Figure 3. Extremes of variation in the color pattern of seven hatchlings of *Gopherus polyphemus*.

During the excavation of the clutches, several eggs were injured. The contained embryos were preserved. One specimen, estimated at 31 days prehatching (on the basis of the date the remaining eggs in the clutch hatched) had a carapace length of 34.1 mm. and width of 27.3 mm. The plastral flexure had not yet appeared. Another embryo, 15 days prehatching, was 41.9 mm. x 36.0 mm. The plastral flexure in this specimen was pronounced. Neither of these specimens showed the yellow coloration of the hatchlings, but rather were varying shades of gray and white. Both showed typical adult scalation. A third embryo, removed from the egg 15 days before the others in the clutch hatched, showed the faintest tinge of yellow on the dorsal laminae, head, and forelimbs. It thus appears that the coloration of the hatchlings develops within the last two weeks of embryonic development.

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